

EOS Mission Support Network Performance Report

This is a monthly summary of EMSnet performance testing -- comparing the measured performance against the requirements.

All results are reported on the web site:

http://netstats.eos.nasa.gov/performance/Net_Health/EMSnet_list.html. It shows MRTG-like graphs of the performance to various test sites, including thruput, RTT, packet loss, and hops, with 1 week, 2 month and 6 month graphs.

Check out the new ENSIGHT web site, mostly working, but still under development:

<http://ensight.eos.nasa.gov/Networks/emsnet/index.html>

Highlights:

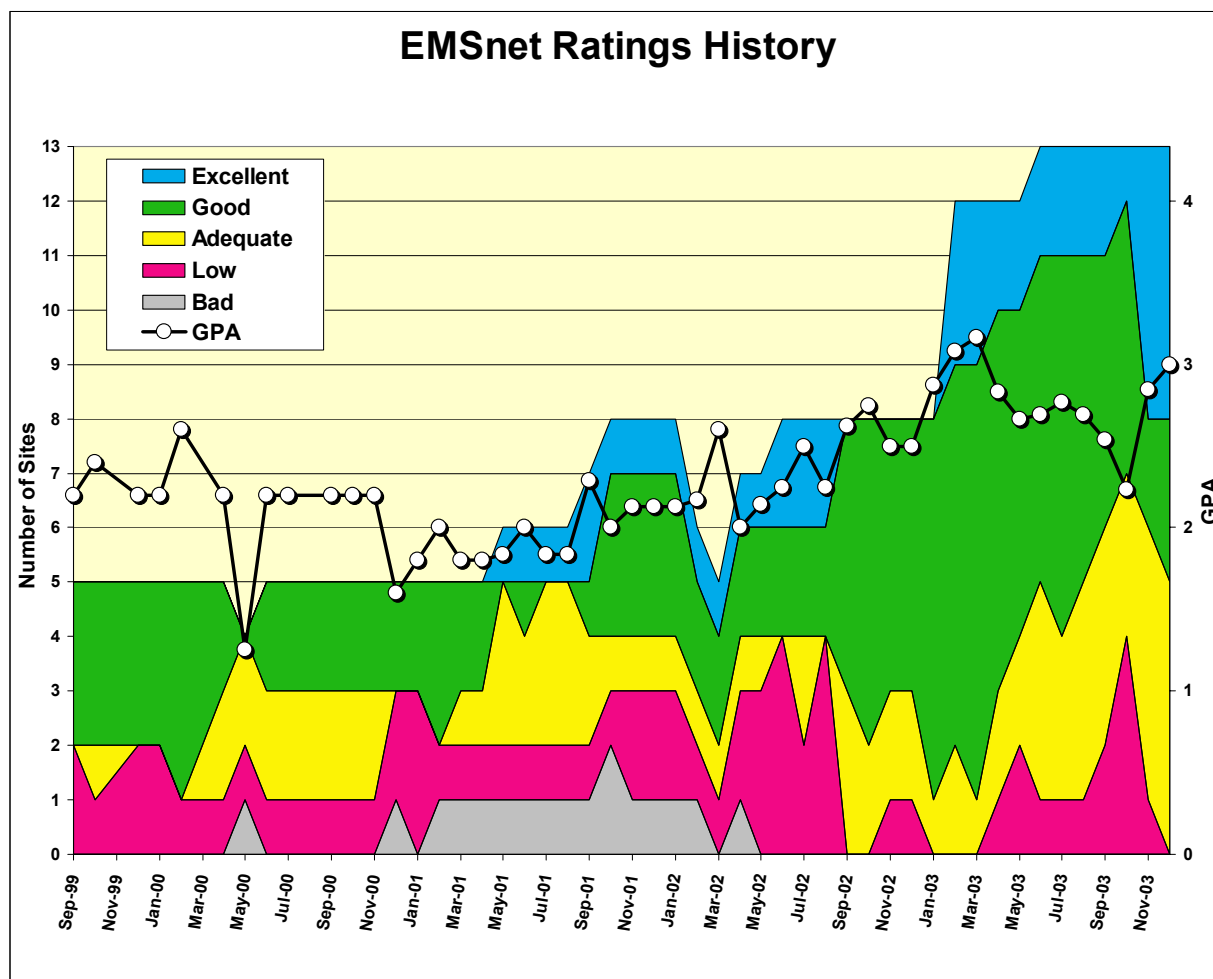
- Test results from GDAAC improved due to the upgrade of the GDAAC firewall – the firewall had been a significant impediment to high thruput. Other DAAC firewalls were also upgraded, with some improvements noted.
- Other test results were stable.
- The removal of the ADEOS requirements improved the ratings in November for the affected circuits.
- **All test results are now "adequate" or better!**

Ratings:

Rating Categories:

Excellent	: $\text{Total Kbps} > \text{Requirement} * 3$
Good	: $1.3 * \text{Requirement} \leq \text{Total Kbps} < \text{Requirement} * 3$
Adequate	: $\text{Requirement} < \text{Total Kbps} < \text{Requirement} * 1.3$
Low	: $\text{Total Kbps} < \text{Requirement}$.
Bad	: $\text{Total Kbps} < \text{Requirement} / 3$

Where Total Kbps = User Flow + iperf monthly average

Ratings Changes:**Upgrades:** ↑GDAAC → EDC: Low → **Adequate**GDAAC → NSIDC: Adequate → **Good****Downgrades:** ↓: None

The chart below shows the number of sites in each classification since EMSnet testing started in September 1999. Note that these ratings do NOT relate to absolute performance -- they are relative to the EOS requirements. The GPA is calculated based on Excellent: 4, Good: 3, Adequate: 2, Low: 1, Bad: 0

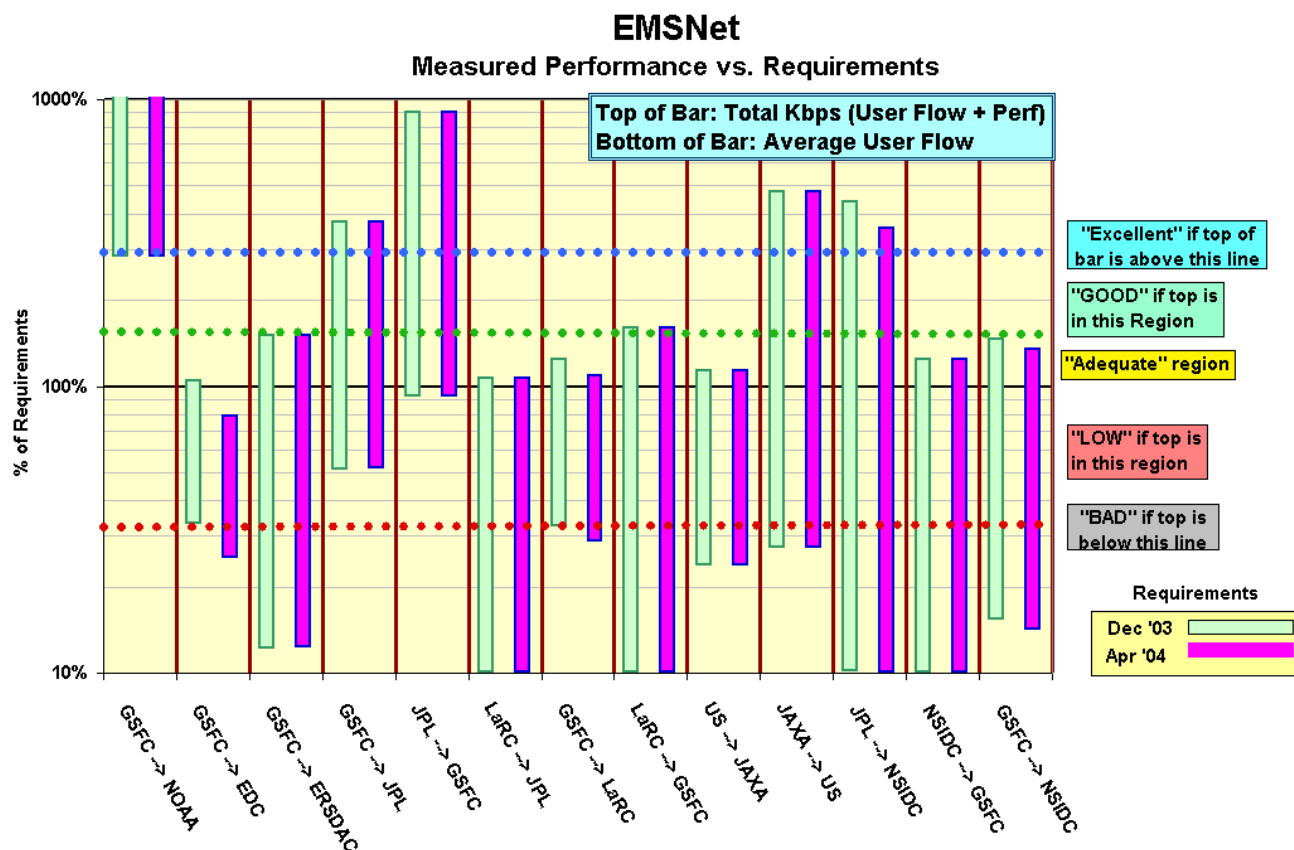
EMSnet Sites

Network Requirements vs. Measured Performance

December 2003		Requirements (kbps)		Testing						
Source → Destination	Team (s)	Current	Future	Source → Dest Nodes	Avg User Flow kbps	Perf Avg kbps	Total Avg kbps	Current Status re	Prev Stat	Current Status re
		Dec-03	Apr-04					Dec-03		Apr-04
GSFC → NOAA	Quikscat	189	189	GSFC-CSAFS → NESDIS	533	2861	3394	Excellent	E	Excellent
GSFC → EDC	MODIS, LandSat	216611	285361	GDAAC → EDCTest	71422	154439	225861	Adequate	L	LOW
GSFC → ERSDAC	ASTER	568	568	GDAAC → ERSDAC	69	783	852	GOOD	G	GOOD
GSFC → JPL	ASTER, QuikScat, MLS, etc.	1601	1597	CSAFS → JPL-SEAPAC	819	5176	5995	Excellent	E	Excellent
JPL → GSFC	AMSR, etc.	626	625	JPL-PODAAC → GDAAC	576	5067	5643	Excellent	E	Excellent
LaRC → JPL	TES, MISR	40311	40311	LDAAC → JPL-TES	2970	40018	42988	Adequate	A	Adequate
GSFC → LaRC	CERES, MISR, MOPITT	52407	59401	GDAAC → LDAAC	16985	47984	64969	Adequate	A	Adequate
LaRC → GSFC	MODIS, TES	31728	31784	LDAAC → GDAAC	242	50506	50747	GOOD	G	GOOD
US → JAXA	QuikScat, TRMM, AMSR	1986	1986	GSFC-CSAFS → JAXA	469	1775	2244	Adequate	A	Adequate
JAXA → US	AMSR	512	512	JAXA → JPL-SEAPAC	140	2311	2451	Excellent	E	Excellent
JPL → NSIDC	AMSR	1079	1342	JPL-PODAAC → NSIDC SIDADS	109	4656	4764	Excellent	E	Excellent
NSIDC → GSFC	MODIS, ICESAT, QuikScat	13326	13326	NSIDC DAAC → GDAAC	302	16319	16621	Adequate	A	Adequate
GSFC → NSIDC	MODIS, ICESAT, QuikScat	61657	66907	GDAAC → NSIDC DAAC	9396	80833	90229	GOOD	A	GOOD
Notes:		Flow Requirements (from BAH) include TRMM, Terra, Aqua, QuikScat, ADEOS-II				Ratings				
*Criteria:		Excellent	Total Kbps > Requirement * 3			Summary	Dec-03	Reg	Apr-04	
		GOOD	1.3 * Requirement <= Total Kbps < Requirement * 3				Score	Prev	Score	
		Adequate	Requirement < Total Kbps < Requirement * 1.3			Excellent	5	5	5	
		LOW	Total Kbps < Requirement			GOOD	3	2	3	
		BAD	Total Kbps < Requirement / 3			Adequate	5	5	4	
						LOW	0	1	1	
						BAD	0	0	0	
Change History:		27-Sep-99	Original - TRMM, Terra, and QuikScat							
		19-Jan-01	Incorporated BAH requirements including additional missions			Total	13	13	13	
		9-Apr-01	Updated BAH requirements							
		4-Jun-01	Added 50% contingency to BAH requirements			GPA	3.00	2.85	2.92	
		16-Nov-01	Added MRTG to lperf, updated requirements, Revised criteria							
		2-Oct-02	Updated to revised BAH requirements							
		7-Mar-03	Updated Requirements, Added tests to GSFC, improved User flow calculation							
		22-Dec-03	Updated Requirements: Remove ADEOS; increase NSIDC							

Comparison of measured performance with Requirements:

This graph shows two bars for each source-destination pair. Each bar uses the same actual measured performance, but compares it to the requirements for two different times (Dec '03, and Apr. '04). Thus as the requirements increase, the same measured performance will be lower in comparison.



Note that this chart shows that the performance to all sites meets current requirements.

Also note that the interpretation of these bars has changed since Sept '01. The bottom of each bar is the average measured MRTG flow to that site (previously daily minimum). Thus the bottom of each bar can be used to assess the relationship between the requirements and actual flows. Note that the requirements include a 50% contingency factor above what was specified by the projects, so a value of 66% would indicate that the project is flowing as much data as requested.

Details on individual sites:

1) ASF

Rating: **N/A**

Web Page: http://ensight.eos.nasa.gov/Networks/emsnet/ASF_EMS.shtml

Test Results:

Source → Dest	Medians of daily tests (mbps)			User Flow	TOTAL
	Best	Median	Worst		
ASF → NESDIS	2.45	2.33	1.06	0.54	2.87
ASF → GSFC-CSAFS	2.70	2.40	1.23		
ASF → JPL-SEAPAC	2.79	2.58	1.27		
GSFC-CSAFS → ASF	2.75	2.68	1.45	.05	2.73

ADEOS Requirement: (Deleted)

Source → Dest	FY	Mbps	Rating
ASF → NESDIS	October '03	1.86	Good

Comments: The 2.55 mbps total from ASF → NOAA is as expected for a 2 * T1 (3.1 mbps) circuit.

The requirement above is from ADEOS, and has now been deleted. The remaining ASF requirements are very low, and mostly based on estimated ECS interDAAC queries, not production flows. These flow estimates are not considered reliable enough to use as a basis for testing, so the rating is "N/A". The rating would have remained "Good" vs. the October '03 requirement.

2) GSFC → EDC:

Rating: **↑ Low → Adequate**

Web Page: <http://ensight.eos.nasa.gov/Networks/emsnet/EDC.shtml>

Test Results:

Source → Dest	Medians of daily tests (mbps)			User Flow	TOTAL
	Best	Median	Worst		
DOORS → EDC Test	n/a	n/a	n/a		
DOORS → EDC DAAC	n/a	n/a	n/a		
G-DAAC → EDC DAAC	202.4	154.4	35.6	71.4	225.8

Requirements:

Date	mbps	Rating
December '03	216.6	Adequate

Comments: The Doors node was removed at the beginning of November, so no results are available from that node. A replacement is expected to be operating in its new location soon.

The performance from GDAAC has improved steadily since mid November, mostly due to the upgrade of the GSFC ECS firewall, and also the EDC ECS firewall (median was only 30 mbps in October, and was 60 mbps last month). However, the user flow dropped from 130 mbps last month.

But for December, the combined user flow and iperf is now above the Dec '03 requirement, so the rating improves to "Adequate".

3) JPL:

Ratings: GSFC → JPL: Continued **Excellent**
 JPL → GSFC: Continued **Excellent**
 LaRC → JPL: Continued **Low**

Web Pages:

http://ensight.eos.nasa.gov/Networks/emsnet/JPL_SEAPAC.shtml
http://ensight.eos.nasa.gov/Networks/emsnet/JPL_PODAAC.shtml
http://ensight.eos.nasa.gov/Networks/emsnet/JPL_TES.shtml
http://ensight.eos.nasa.gov/Missions/terra/JPL_MISR.shtml

Test Results:

Source → Dest	Medians of daily tests (mbps)			User Flow	TOTAL
	Best	Median	Worst		
GSFC-CSAFS → JPL-SEAPAC	6.06	5.18	2.49	.82	6.00
LaRC DAAC → JPL-TES	40.35	40.02	25.59	2.97	42.99
LaRC DAAC → JPL-MISR	38.04	37.88	23.85		
JPL-PODAAC → GSFC DAAC	8.12	5.07	2.31	0.58	5.75

Requirements:

Source → Dest	Date	mbps	Rating
GSFC → JPL combined	Dec '03	1.60	Excellent
JPL → GSFC combined	Dec '03	0.62	Excellent
LaRC DAAC → JPL-TES	Dec '03	30.6	Good
LaRC DAAC → JPL-MISR	Dec '03	18.5	Good
LaRC DAAC → JPL-Combined	Dec '03	49.1	Low ?

Comments:

GSFC → JPL: Performance on this circuit has been mostly stable since the BOP switchover on 15 August '02. However, on 16 June 2003, performance from MTVS1 to JPL PODAAC, and from G-DAAC to JPL-TES dropped and became noisier. (For example, from MTVS1 to PODAAC, the median dropped from 5.8 mbps to 2.8). However, the GSFC-CSAFS → JPL-SEAPAC results above (still stable) shows that the problem is not in EMSnet. This month the total was slightly higher than last month; well above the requirement..

LDAAC → JPL: Performance from LDAAC to JPL-TES has been very stable since June 23, '03, when the PVC was set to the current value of 45 mbps. The combined MRTG and iperf values total very close to this value, indicating that the circuit is working to its specifications.

The route from LDAAC to the JPL-MISR SCF was switched to EMSnet in July. The performance for LDAAC to JPL-MISR via EMSnet shown above is, as expected, very similar to the performance to TES.

The MISR requirement is open to some interpretation. The formal QA flow is only 9.7 mbps. But the science data also flows on the same circuit. This pushes the total MISR flow requirement to 18.5 mbps.

When this 18.5 mbps MISR requirement is added to the 30.6 mbps TES requirement, the 49 mbps total requirement is higher than the measured performance, and also higher than the nominal circuit speed. Thus the rating remains "Low". But the rating would be "Adequate" based only on the formal QA requirement.

This configuration is based on a management decision to set the circuit capacity at this level to reduce cost, in the expectation that both projects' requirements are bursty and include contingency. Thus the actual requirements of both projects are expected to be met with this circuit capacity.

JPL → GSFC: The requirement from JPL to GSFC includes flows from NASDA and ASF which go via JPL, and includes GSFC and NOAA destinations. Since many of these flows were related to ADEOS, this requirement dropped substantially with the removal of ADEOS. The iperf flow dropped from a median of about 8.5 mbps around 20 October, apparently due to a PVC change. The combined Dec '03 requirement is now only 0.62 mbps, and the combined 5.4 mbps thruput is more than 3 times that, so the rating remains "Excellent".

4) NSIDC:

Ratings: GSFC → NSIDC: ↑ Adequate → **Good**
 NSIDC → GSFC: Continued **Adequate**

Web Page: http://ensight.eos.nasa.gov/Networks/emsnet/NSIDC_EMS.shtml

GSFC ↔ NSIDC Test Results:

Source → Dest	Medians of daily tests (mbps)			User Flow	TOTAL
	Best	Median	Worst		
GSFC-DAAC → NSIDC	89.0	80.8	11.0	9.4	90.2
NSIDC → GSFC-DAAC	16.6	16.3	7.2	0.3	16.6

Requirements:

Source → Dest	Date	mbps	Rating
GSFC → NSIDC	Dec '03	51.1	Good
NSIDC → GSFC	Dec '03	16.4	Adequate

Comments:

GSFC → NSIDC: Performance from GSFC to NSIDC improved in mid November, mostly due to the upgrade of the GSFC ECS firewall (The median was 35 mbps in October, and 55 mbps last month). Independently, the requirement was increased to recognize that the required flows must finish in a limited (less than 24 x 7) workweek. This higher performance is now more than 30% above the increased requirement, so the rating improves to "Good".

NSIDC → GSFC: Performance from NSIDC to GSFC remains steady, but the requirement increased due to the incorporation of an ICESAT flow from LASP to GSFC. The performance is now slightly above the requirement, so the rating remains "Adequate".

Other Testing:

Source → Dest	Medians of daily tests (mbps)			Requirement	Rating
	Best	Median	Worst		
JPL → NSIDC-SIDADS	5.86	4.66	3.42	1.08	Excellent
GSFC-ISIPS → NSIDC	6.98	6.47	4.15		
LDAAC → NSIDC	4.83	4.68	4.52	0.07	Excellent

Comments:

JPL → NSIDC-SIDADS: Performance has been very steady from JPL since the Aug '02 BOP switchover, exceeding the modest requirement (revised down from 1.5 mbps in November).

GSFC-ISIPS → NSIDC: Testing is ftp pulls by NSIDC from ISIPS. Performance is very steady at 7 mbps, apparently limited by ftp window size. Manual testing using iperf between the same machines in the same direction gets over 20 mbps.

LDAAC → NSIDC: Thruput from LDAAC to NSIDC has been steady since August. The very low requirement produces a rating of "Excellent".

5) GSFC ↔ LaRC:

Ratings: GDAAC → LDAAC: Continued **Adequate**
 LDAAC → GDAAC: Continued **Good**

Web Page: <http://ensight.eos.nasa.gov/Networks/emsnet/LARC.shtml>

Test Results:

Source → Dest	Medians of daily tests (mbps)			User Flow	TOTAL
	Best	Median	Worst		
GDAAC → LDAAC	55.1	48.0	22.9	17.0	65.0
LDAAC → GDAAC	51.1	50.5	27.7	0.2	50.7

Requirements:

Source → Dest	Date	Mbps	Rating
GDAAC → LDAAC	Dec '03	52.4	Adequate
LDAAC → GDAAC	Dec '03	31.7	Good

Comments: **GSFC → LaRC:** Performance improved in mid November, mostly due to the upgrade of the GSFC ECS firewall (The median was 34 mbps in October, and 44 mbps last month). The combined thrupt is above the Dec. '03 requirement, but not by a 30% margin, so the rating remains "Adequate".

LaRC → GSFC: Performance remains stable since the June '03 upgrade to meet the backhaul requirements. The FY '04 requirement jumped from 6.8 mbps to 44.8 mbps in Oct '03, to incorporate this backhaul of all LaRC science outflow via GSFC (which has apparently not started thus far). The requirement was revised downward this month to 31.7 mbps. The thrupt is more than 30% above this new requirement, so the Dec '03 remains "good".

6) NOAA NESDIS:

Rating: Continued **Excellent**

Web Page: http://ensight.eos.nasa.gov/Networks/emsnet/NOAA_NESDIS.shtml

Test Results:

Source → Dest	Medians of daily tests (mbps)			User Flow	TOTAL
	Best	Median	Worst		
GSFC-CSAFS → NESDIS	2.86	2.86	1.56	0.53	3.39
ASF → NESDIS	2.45	2.33	1.06		
NASDA → NESDIS	1.58	1.56	0.47		

Requirements:

Source → Dest	FY	Mbps	Rating
GSFC-CSAFS → NESDIS	'04	0.19	Excellent

Comments: With the deletion of the ADEOS flows from ASF, the dominant flow to NOAA is Quikscat data, from GSFC CSAFS.

Note that the 3.4 mbps total from CSAFS → NOAA exceeds the nominal 3.1 mbps for the 2 * T1 circuit. This shows the danger of adding together sampled medians. In this case the iperf tests are usually unaffected by the sporadic user flows, and normally get full circuit bandwidth. Adding the low but significant user flow then exceeds the circuit capacity. Since this is more than 3 times the FY '04 requirement, the rating is "Excellent".

Also note that the flow from NASDA is limited by the TCP window size of the NASDA test source, and the long RTT.

7) GSFC → ERSDAC:Rating: Continued **Good**Web Page : <http://ensight.eos.nasa.gov/Networks/emsnet/ERSDAC.shtml>

Test Results:

Source → Dest	Medians of daily tests (kbps)			User Flow	TOTAL
	Best	Median	Worst		
GSFC → ERSDAC	798	783	370	69	852

Requirements:

Source → Dest	FY	Kbps	Rating
GSFC → ERSDAC	'03, '04	568	Good

Comments: Thruput since June '02, using the 1 mbps ATM connection had been very stable (except for a problem period from 12 November '02 to 3 Jan '03). The requirement was revised down from 668 kbps last month, so the total user flow plus iperf is now more than 30 % over the requirement, and the rating remains "Good".

8A) US → JAXA (formerly NASDA):Rating: Continued **Adequate**Web Page: http://ensight.eos.nasa.gov/Networks/emsnet/NASDA_EOC.shtml

Test Results:

Source → Dest	Medians of daily tests (mbps)			User Flow	TOTAL
	Best	Median	Worst		
GSFC-CSAFS → JAXA-EOC	2.06	1.78	1.23	0.47	2.24
ASF → JAXA-EOC	2.17	1.94	1.19		

Requirements

Source → Dest	FY	mbps	Rating
GSFC → JAXA	Dec '03	1.99	Adequate

Comments: Performance steady -- about as expected for the 3 mbps ATM PVC (using multiple TCP streams to mitigate the TCP window size limitation at JAXA). Results from ASF to NASDA were a bit better than from CSAFS. The requirements above are lower than previously, due to the removal of ADEOS requirements. Thus the rating improves remains "Adequate".

But the requirements still include 4 ISTs at JAXA for AMSR-E. Each IST has a requirement for 311 kbps, for a total of 1244 kbps. This requirement causes the rating to be "Adequate", even though the performance was stable. It could be questioned whether JAXA intends to operate all four of the ISTs simultaneously, or whether some ISTs are backups, in which case the network requirements would be reduced to a lower value.

8B) JAXA (formerly NASDA) → US:Rating: Continued **Excellent**

Web Pages: http://ensight.eos.nasa.gov/Networks/emsnet/JPL_SEAPAC.shtml
http://ensight.eos.nasa.gov/Networks/emsnet/GSFC_SAFS.shtml

Test Results:

Source → Dest	Medians of daily tests (mbps)			User Flow	TOTAL
	Best	Median	Worst		
JAXA-EOC → JPL-SEAPAC	2.32	2.31	1.43	0.14	2.45
JAXA-EOC → GSFC-CSAFS	1.42	1.39	0.93		

Requirements:

Source → Dest	FY	mbps	Rating
JAXA → US	'03, '04	0.51	Excellent

Comments: Performance continues stable on the new circuit. The requirement dropped in November due to the removal of ADEOS requirements, increasing the rating to "Excellent".

Note: JAXA has not yet implemented testing with multiple tcp streams. So performance to GSFC is limited by the TCP window size on JAXA's test machine, in conjunction with the long RTT. Therefore, in order to reflect the actual capability of network, the rating is derived from testing from JAXA to JPL. This test uses the same Trans-Pacific circuit, but has a shorter RTT, so will not be as severely limited by the TCP window size. The Trans-Pacific circuit connects into the higher speed domestic EMSnet at JPL, which is not expected to be the limiting factor.